

# **OPTION A: ANALYTICAL CHEM**

## **A1 — ANALYTICAL TECHNIQUES**

IB Chemistry

TAD01



# A1 – Analytical Techniques

- A.1.1 State the reasons for using analytical techniques. (1) *Uses should include structure determination, analysis of composition of substances and to determine purity.*
- A.1.2 State that the structure of a compound can be determined by using information from a variety of analytical techniques singularly or in combination. (1) *Students should realize that information from only one technique is usually insufficient to determine or confirm a structure.*



# Topic Justification

## A.1.1 State the reasons for using analytical techniques. (1)

### ■ Qualitative Analysis

- The identification of elements or compounds present in a sample
- Ex: Flame tests, precipitation reactions

### ■ Quantitative Analysis

- The determination of the amounts of elements or compounds present in a sample
- Quality Control: Used to ensure that levels of contaminants or harmful residues are below specific levels
- Structural Analysis: Identifying functional groups and structure of a molecule

Ex: Titrations, UV/Visible/IR Spectroscopy, chromatography



# Areas that utilize Analytical Techniques

- **Monitoring and Control of Pollutants:**

- Presence of hazardous materials
  - Heavy Metals, Organic chemicals, Atmospheric pollutants

- **Clinical and biological studies:**

- Levels of important nutrients in food
- Body fluids (Iron, Cholesterol, etc)

- **Geological Studies**

- For mining of minerals, metals, and metal complexes

- **Drug Discovery**

- Confirmation of newly synthesized materials

- **Food Purity**

- For pollutants, toxins, pathogens

- To ensure that legal levels of additives are not exceeded



# Multiple Points of View

A.1.2 State that the structure of a compound can be determined by using information from a variety of analytical techniques singularly or in combination. (1)

- For many molecules, a single technique for identification is not sufficient
- Each technique provides a different kind of feedback
  - IR: presence of functional groups
  - NMR: structure
  - MS: abundance and structure
- Determining (or verifying) the properties of a compound is like putting together the evidence of a crime scene to solve a mystery
- Some techniques are view simultaneously:
  - GC-MS – Gas Chromatography + Mass Spectrometry
  - GC-IR – Gas Chromatography + Infrared Spectroscopy
  - LC-MS – Liquid Chromatography + Mass Spectrometry

